The Madras Agricultural Journal.

(ORGAN OF THE M. A. S. UNION)

Vol. XXX JULY 1942 No. 7.

EDITORIAL

Groundnut Oil as Engine Fuel. With the closure of foreign markets brought about by the war, the groundnut grower in this country was confronted with a serious problem, as during normal times about 50 per cent of the Indian produce was exported to European markets at attractive prices. It was then apprehended that large surpluses would be left over and that prices would ebb down to distressing levels. It was also feared that *Groundnut* which is probably the only attractive "cash crop" of the poor dryland farmer would no more provide him the little cash he is sorely in need of to purchase his bare necessities of daily life. Anticipating a catastrophic crisis in this Province, which has an area of over $3\frac{1}{2}$ million acres under this crop and an exportable surplus of nearly 8 lakhs of tons of groundnuts, we had the necessity on more than one occasion to draw the attention of the cultivator, the trade and the public to the utmost necessity to find extended uses for groundnut and suggest among other things the development of the "Vegetable ghee" industry and the wide spread use of groundnut cake as manure and feed for cattle. Thanks to the efforts of the Government of India and the various Provincial and State Governments and certain non-official agencies interested in the Industry, the situation has eased considerably and the prices have regained pre-war levels chiefly due to lesser output and increase in internal consumption. We are now glad to note that researches carried out by the Industrial Research Bureau and other research organisations have shown yet another use for vegetable oils. It has been proved beyond doubt at more than one centre of investigation, that groundnut oil can be used as fuel in place of crude oil in internal combustion engines. In most of the trials, the startability, smoothness of running, and power output were almost equivalent to those of crude oil. The Government of Madras have recently issued two press communiques on this subject based on preliminary tests conducted at the Engineering College, Guindy, and have indicated clearly that "groundnut oil is a very good substitute for diesel oil". These findings have instilled confidence in the minds of the agriculturists and the small industrialists who were running short of crude oil and getting panicky due to the progressive fall in the supplies of mineral oil. It is hoped that the investigations now started

will be continued to thoroughness and that complete and reliable information on the uses of groundnut and other vegetable oils as fuel, lubricants and illuminants will be available to the public ere long. Such research is of paramount importance to a country like India with its large and inexhaustible wealth in oil-yielding seeds and almost negligible mineral oil resources. It may however be contended that the comparative cost of these oils will militate against the widespread use of vegetable oil as engine fuel. It is no doubt true that during normal times, vegetable oils are dearer than mineral oils, but they have the advantage that there are a variety of them in India, suitable for growing under diverse conditions of soil and climate and that they are locally available for crushing in the ordinary wooden *chekkus* even in the remotest corner of the country without having the necessity to transport them over long distances at considerable cost and trouble. Once the efficiency of vegetable oil for fuel and lubrication is established and suitable modifications in the design of the engine parts are suggested, production will step up to considerable extent which in turn will keep down prices to reasonable limit. Moreover, at the present rate of consumption of petroleum derivatives for war machines and the scorched earth policy followed by the warring nations, particularly in regard to mineral oil supplies, it is unlikely that this oil will be available for civil consumption in any appreciable quantity. Countries like India have to look to indigenous substitutes like vegetable oil for running their machinery. This development in the use of oil seeds will indirectly benefit the country as large quantities of the residual cake which is considered an excellent nitrogenous fertilizer will be available locally for application to crops for increasing production.

The Mysore Agricultural Journal, the organ of the Mysore Agricultural and Experimental Union, a sister journal to ours, after running into nineteen volumes has changed its name to *The Mysore Agricultural Journal* and is very neatly and attractively got up. As usual the journal is being run in Kannada also. A feature of this journal is that the *raiyat's* own results are given a prominent place, which we are sure will bring out a number of new problems. We wish the *Mysore Agricultural Journal* a long and as useful and instructive career as the one it has replaced.

The Coimbatore Agricultural College Dairy.

By V. KARUNAKARAN NAIR, B. Sc. (Ag.),
Dairy Manager, Agricultural College, Coimbatore.

Introduction. A small dairy is attached to the Coimbatore Agricultural College. It functions as an educational medium for imparting first hand knowledge on breeding, feeding and general management of cattle together with the production and handling of milk and its products. In addition, it serves as a unit for the supply of dairy products to limited customers.

The Dairy Herd. The College dairy herd consists of about 25 to 30 cows, mostly cross-breds and a few Sindhis headed by a Sindhi bull. The animals are the remnants of the cross-breeding experiments that were started a few years back with Ayrshire bulls Since the winding up of this experiment owing to the gradual degeneration of the crosses, the policy has been to breed back to the Sindhi, to enhance the percentage of indigenous blood in the resulting crosses. The results are fairly satisfactory in that some of them give better yield than the Sindhis. The following are the details of the dairy herds:

Particulars.	*1939–40.*	*1940–41.*
1. Average number of cows maintained	28·6	25 4
2. Average number of milch cows	19·8	17·4
3. Total milk yield for the year	118,047 lb.	115,658 lb.
4. Average yield of milk per cow per day	16·1 ,,	18·0 ,,
5. Average yield overall in the herd	11·1 ,,	12·3 ,,

The Dairy Equipment. There are four cattle stalls one for the milch cows, another for the dry, a third for the pregnant cows and a small one for the calves, all fenced and provided with water taps. There is a milking shed to milk about 50 animals at a time. There is a dairy building to handle and process milk and milk products. There is a feed store with soaking troughs in them. There are about 16 acres of paddocks to serve as grazing and exercising ground for the cattle. Three milk-men, two men to work in the yard, one calf boy, and three men in the dairy are employed.

Daily routine. The work starts at four in the morning. Milch animals are brought to the milking shed and are tied in their respective places. Their hind quarters are washed and groomed. Milking commences at five and lasts till six They are then fed with half the concentrates and then let out for grazing. Dry cows are groomed as well, fed and let out for grazing. The bull and the suckling calves are exercised separately. The animals are brought back at 11 and fed with a third of the bulky fodder in the stalls. Calves are fed on *Kanji*. The noon feeding of the concentrates is done between 2 and 3 and the evening ration of bulky fodder—the balance two thirds—put in the troughs by 5 P M. Sick animals are taken to the veterinary hospital whenever required Milking is done twice, once in the

morning before feeding and once in the evening after feeding. Calves are fed immediately after milking. The milk is then distributed to customers. The surplus is converted into butter.

What students learn. Students take part in all items of work connected with cattle management and dairy practice. In brief, they learn about breeding, feeding and general management of cattle.

Breeding. General principles as to the method of breeding, the interval between the breeding seasons, types of breeding, like cross-breeding, back-crossing and grading, are demonstrated here. The student gains practical knowledge regarding the aspects of cattle breeding, such as, cross-breeding, back crossing and pure line breeding. Incidentally he learns that the selection of the bull is based on the following:—that the animal is of proper size with a pleasing appearance, is active and energetic with a compact frame, a wide chest and well sprung ribs, a good set of legs under a well developed barrel; that he is backed up by a line of good ancestors; that his half sisters have done uniformly well; that he is neither under nor over aged. Records reveal to him that no bull is allowed to serve more than about 50 to 60 cows per year.

As regards the onset of oestrum he sees some difference between that prevailing in the village and that in the farm. Conditions prevailing in the farm are more of a uniform type with regard to the feeding, housing and general management that to a certain extent they adapt themselves to this artificial method rather than be season bound. Thus very definite breeding seasons are not observed in the farm as in the village though there is some concentration between November and December. Whereas the village cow is subjected to the vicissitudes of the seasonal variations and the resultant environmental conditions, that of the cow in the farm is more uniform and in consequence the attendant changes are less marked. To a certain extent the regulations of the calving seasons is of utmost importance in a commercial world where seasons of demand have to be studied and attended to promptly. In the farm the breeding and the calving seasons have been regulated to a certain extent so that a uniformity of production is obtained throughout the year as will be seen from the 16 years average noted below:—

Month.	No. of calvings.	Month.	No of calvings.	Month.	No. of calvings.
December	2·9	May	1·6	October	1·4
November	1·9	September	1·6	January	1·4
June	1·7	August	1·5	April	1·3
July	1·7	February	1·5	March	1·0

Service. The cows invariably come to heat six to eight weeks after calving. Most of the cows that come to heat within that period are served, though in the case of some heavy yielders the service is slightly delayed lest it should be difficult to dry them off at advanced pregnancy. The general signs of heat in a cow are reduction in milk yield, cessation of

rumination, general restlessness, bellowing, frequent urination, switching of the tail, trying to mount over other cows and trying to be mounted over by other cows and discharge from the genitals. Immediately, the cow is taken to the bull and got served. After service the animal shows a tendency to strain and arch its back. A dash of cold water is directed against the genitals and a pat given on the back of the animal to prevent its arching the back. The animal is tied in the stall for sometime and given bran mash only. In case of ineffective service the heat generally recurs on the 21st day.

Feeding. A rational system of feeding is in vogue on the farm. Feed is varied on the basis of the requirements of the various classes of cattle. This is based on the principle that the requirements of the calf is for its rapid growth, that of the dry cow for its maintenance only, that of the pregnant cow for its maintenance as well as to the growth and development of the foetus inside and that of the milch cow for its maintenance and the production of milk.

The feed requirements of the animals are partly met by concentrates and partly by bulky fodder. The former consist of groundnut cake, cotton seed, rice bran and *dhall* husk. Bulky fodders include fodder *cholam*, fodder maize, Guinea grass and lucerne. Food adjuncts included are salt and mineral mixture. In addition, the cattle get a few hours of grazing but what little they get is restricted to the months from October to January. Care is taken to see that the animals are fed at regular intervals with balanced diets containing the proper nutrients such as proteins, carbohydrates, fats, minerals and vitamins in the right form and quantity; that there is succulence and varieties in the rations, not to speak of cheapness and economy. The quota of each animal is divided and fed twice or thrice as the case may be. Individual attention is given with regard to feeding. Cattlefoods are soaked in the respective feed troughs after the quota of each is measured out.

Rearing of calves. The calves at birth are weaned and removed from the dam. They are then rubbed dry, the naval cord is cut one inch below the naval ligatured and painted with tincture-iodine to prevent naval infection. They are then taught to drink by pressing their heads down into a bucket containing the required quantity of milk and inserting one finger dipped in milk into its mouth. The calf begins to lick the finger and learns to drink. While in the act, it automatically sucks in the milk in the bucket. Gradually the calf learns to drink from the bucket without help. Subsequently the time of feeding is regularised, morning, noon and evening. The quantity given varies slightly from the first to the seventh day. To start with the calf gets 5 to 6 pounds of milk every day, fed thrice a day. Gradually this is raised to 8 pounds a day i. e. three pounds in the morning, two pounds in the noon and three pounds in the evening. The average weight of a calf at birth is between 50 and 60 lb. and a ration of one pound of milk per day for every ten pounds live weight of the calf has been found to

be reasonable. By about the second week, it gets about 8 lb. a day and this quantity is continued to be fed till the end of the month. From about the third week the calf is trained to lick wheat bran and bite green blades of grass. Immediately after the feeding of milk a small quantity of wheat bran is smeared over its muzzle. It develops a tendency to lick and begins to have a liking for the bran. A sprinkling of bran is placed in the trough in front of the calf which it subsequently learns to lick and eat. In the same trough bits of tender grass are put. Their natural instinct prompts them to bite. The calf is thus initiated to trough feeding. During the first month the calf remains muzzled except at feeding time. This prevents them from licking each other and preventing the formation of hair-balls in their stomach and also prevents them from eating earth, resulting in gastric trouble. From the second and third month the milk is reduced to four pounds i. e. two pounds in the morning and two pounds in the evening but one pound of concentrates, half in the morning and half in the evening is included. In addition, it gets half a pound ragi and quarter pound maize in three pounds of skim milk, as gruel in the noon Green fodder is fed as much as it would consume. From the fourth to the sixth month milk is reduced to two pounds—one pound in the morning and one pound in the evening, the gruel raised to six pounds and the concerntrates, to one and a half pounds. After the sixth month, they get no milk but about one and a half to two pounds of concentrates and liberal quantities of green fodder. The quantity of concentrates are graudally increased so that by the end of the year they would be getting about two to three pounds.

When a yearling, they get about four pounds of concentrates made up of equal quantities of groundnut cake, cotton seed, rice bran and *dhall* husk mixed with two ounces of salt and two cunces of mineral mixture. Good growth and development is attained in about two and a half years, when the animals come to heat. The animal is then served. Provided the service is effective it calves in about 285 days

Care of cow in calf. Two months before calving the pregnant cow is separated from the rest of the animals, is grazed separately and fed on a slightly changed ration of about 4 to 6 lb. of concentrates. Care is taken to see that the feed given has a laxative effect. This is ensured by the incorporation into the mixture of sufficient quantities of wheat bran and providing plenty of succulent fodder. A week before calving the concentrates are gradually reduced and more bran is given in the form of a mash. The bran mash is continued even after three or four days after calving. Subsequently the concentrates are slightly increased. Gradual increase is effected and in ten to fifteen days after calving it gets its normal ration.

Rations for milch cows. The proper ration consists in giving a maintenance ration of 2 lb. of concentrates plus a productive ration of 3 lb. of concentrates for every 10 lb. of milk that it gives; that is if a cow gives 10 lb. of milk, it gets 5 lb. For every 10 lb. of milk above this quantity 3 lb. of concentrates are to be added

Economy of heavy producers. The cost of production of milk from cows of different grades differs. Among three cows of practically the same age, size and lactation, that give 10, 20 and 30 lb respectively the cost of milk production varies as follow:—

Quantity of milk obtained per day	Concentrates to be given for			Total cost of feed @ 0—0—5 a lb	Cost per pound of milk.
	Maintenance.	Production of milk.	Total.		
lb.	lb.	lb.	lb.	Rs. as. ps	Rs. as ps.
10	2	3	5	0 2 1	0 0 2½
20	2	6	8	0 3 4	0 0 2
30	2	9	11	0 4 7	0 0 1¾

It would thus appear that the high yielding cows produce milk cheaper than the low yielding ones.

Variations in lactation yield. As the milk yield increases the concentrates are increased. The lactation curve goes on rising from the date of calving to about the 3rd or 4th week; then remains stationary to about the 8th or 12th week and then gradually declines. It will thus be seen that the peak of production is reached within about the 3rd to 8th week and this determined, it has been possible to predict milk yield of the cow for the lactation. There is a natural fall from the 8th to the 12th week onwards. Invariably weaned cows come to heat within that period. Advantage is taken of this and the animals are allowed to be served. Such a practice ensures a fairly regular calving at frequent intervals ranging from 16 months. Further it has the distinct advantage in the economical working of the dairy in that enhanced milk yields are obtained at regular intervals in addition to a calf at an interval not longer than 13 months to 16 months. This practice is in distinct contrast to what obtains in the villages. The villagers serve their cows 8 to 10 months or even one year after calving. They do so because (1) the calves in the villages are allowed to suckle their dams and (2) the people have a mistaken notion that the milk yield goes down immediately after service.

Advantages of weaning calves. The advantages of weaning calves are many. It accurately gauges the milk yield of the cow; enables the cow to be milked even after the death of the calves, enables the correct feeding of the calves; prevents the rush and buzzle at milking time; enables clean milking and makes the cow come to heat earlier.

Advantages of early service after calving. Getting animals served 2 to 3 months after calving enables them to calve every year, or at slightly longer intervals with the attendant increased flow of milk. The average yield of milk per day of the cow is high and therefore the cost of milk production is lowered. The dry period is lessened. The village cows get served only towards the end of their lactation. The lactation period is unusually long, with the consequent reduction in the daily average. The dry period is very long. The fear that service brings about a reduction in

milk yield is not based on experimental data. In some cases no doubt there is a reduction as a result of the onset of oestrum, but the reduction is gradually made good within a day or two after service. The real fall due to service takes place only five months after conception. The usual decline in milk yield after the third month should not be mistaken for that due to service. The *ryot* feels that he gets his usual $1\frac{1}{2}$ to 2 lb. of milk for a very long period but cares little to note at what cost; nor does he foresee the uneconomic dry period. His satisfaction is that he does not need to feed the dry cow. The fact that an ill-fed dry cow shows itself out by a reduced yield in the subsequent lactations also escapes his notice. In the case of a cow served 3 months after calving we get a yearly yield of say 3000 lb. plus a calf; in the case of one served 12 months after calving we get the same yield in two years. The disparity is clear.

Rations for dry cows. With the decline in the milk yield the concentrates are reduced from time to time till at last it gets the barest minimum—say 2 to 3 lb. A little over two months before calving the cow if it persists to give milk is dried off as follows:— Concentrates and green fodders are withheld. Only straw is fed. Grazing too is denied. Milking is done only once, subsequently once in alternate days, then once in three days and so on until it gets dried off. After the animal is dried it is gradually given enhanced feed till at last it receives about 4 to 6 lb. of concentrates with wheat bran as the chief constituent. A few days before calving feeding is given as mentioned already.

The dry cow gets a normal ration of 3 lb. of concentrates made up of equal quantities of groundnut cake, cotton seed, rice bran, *dhall* husk, with about 12 to 15 lb. of dry fodder. Two ounces of salt and 2 oz. of mineral mixture (equal parts of extra fine steamed bone-meal and slaked lime) are added to the concentrates. The concentrates are reduced if plenty of grazing is available. If not, it is kept up.

Rations for breeding bulls. The breeding bulls are fed on 4 to 6 lb. of concentrates of the composition said above and 15 to 18 lb. dry fodder. During seasons of many services, it gets 6 lb. of concentrates and at other times 4 lb.

Cost of breeding stock:—	Rs	as.	ps. per day.
Cows giving 40 lb. milk	0	7	6 ,,
,, 30 lb. ,,	0	6	7 ,,
,, 20 lb. ,,	0	5	5 ,,
,, 10 lb. ,,	0	4	5 ,,
Dry cow	0	3	2 ,,
Breeding bull	0	4	9 ,,

Cost of rearing:—	Calf upto one year	Rs. 85.
	Heifer upto maturity	Rs. 280.
	A bull upto maturity	Rs. 300.
	A cow from calving to calving	Rs. 145 to 185.

Green fodder. The green fodder for the dairy animals are grown in the Central Farm attached to the Agricultural College. Annual fodders such

as *cholam* and maize, and perennials like lucerne and Guinea grass are cultivated. The annuals are sown in small areas at fortnightly intervals to ensure a regular supply. The daily requirements are cut every day and a judicious mixture of the different feeds in the proportion 20 lb. of *cholam* or maize fodder, 20 lb. of Guinea grass and 10 lb. of lucerne is fed to each animal, to give variety, palatability, succulence and above all proper nutrients. Green grass growing on field bunds are also cut and fed instead of *cholam,* maize or Guinea grass Cane tops, which are available in the months of December to January are also fed. Occasionally sweet-potato vines, *pillipesara (Phaseolus trilobus)* and sunnhemp are also included according to availability. Silage is made of grass or green fodder in seasons of plenty for use during the hot months.

Housing. Particular attention is necessary in the construction of proper stalls for housing the cattle, though they may appear to be too costly for an ordinary *ryot.* In the construction of a cattle stall one has to see to the following. That the animal gets sufficient protection from extremes of climate; that sufficient and convenient accommodation is provided; that the stalls are well lighted and ventilated; that the flooring is impervious, non-slippery, easily cleaned and not cold; that the urine and other washings are drained in proper channels to a distant place from the stalls; that there is sufficient accommodation to move about for feeding and tending cattle and that the surroundings are neat and clean. These are some of the essentials which demand no doubt some money. Thought, care and kindness to the dumb animals are more essential in rearing.

Dairy. The dairy practices include milking and the processing of milk and milk products. Milking is done twice. The milk is weighed and filtered. Receipt from each cow is recorded against the respective animals in a milk yield register. By so recording profitable cows are detected, feeding is done economically and reduction in milk yield is found out so that causes may be investigated. Sick animals may be brought to light earlier.

Disposal of milk. Milk at body heat is fed to suckling calves. The customers are then supplied. The surplus is then separated in a centrifugal cream separater into about 10 per cent. (by weight) of cream and 90 per cent. of skim milk.

Preparation of butter The cream is heated in a water bath to about 160°F. for about half an hour, then cooled and about 2 to 3 per cent of buttermilk is added, stirred and kept aside for ripening overnight.

The ripened cream kept over night is taken in the morning, an equal amount of cold water is added and churned in a wooden churn. When it just begins to granulate as is indicated by the clearing of the "peep glass" more cold water is added and churned until granules assume the size of *cholam* grains. The butter is washed twice with cold water to free

it of all buttermilk to enhance its keeping quality. Then it is pressed in a butter worker to free it from superfluous water. Then salt at the rate of $\frac{1}{4}$ ounce per lb. of butter is added and incorporated on the butter worker. It is then packed and preserved in cold storage. The watery buttermilk is fed to poultry. About 5 to $5\frac{1}{2}$ lb. of butter are obtained from 100 lb. of milk which when melted would yield about $3\frac{3}{4}$ lb of ghee. This method of butter making in contrast to the local method has the following advantages. 1. loss of butter is minimised in the working process 2 quality is enhanced, as also keeping quality, 3. time, labour, cost of utensils involved are minimised, 4. fresh skim milk is obtained. The skim milk is partly fed to calves and partly sold to customers It makes good curds It may not be so tasty as the one from whole milk but sufficiently rich to produce effective growth and development in children.

Disposal of Dairy produce The main items of sale in the dairy are milk, butter, skim milk and ghee.

It is most economical to sell milk as such, as disposing it off as milk products involves loss as shown below:—

			Loss in sale of milk products.
1. 100 lb. whole milk at $1\frac{1}{2}$ annas per 1 lb.	Rs. 9 6 0		
2. 100 lb. milk converted into butter and skim milk—5 lb. of butter at Re. 1 per pound	Rs. 5 0 0		
90 lb. of skim milk at 6 pies per pound	Rs. 2 13 0		
Total.	Rs. 7 13 0		Rs. 1 9 0
3. 100 lb. of milk converted into ghee and skim milk—$3\frac{3}{4}$ lb. of ghee at 12 annas per lb.	Rs. 2 13 0		
90 lb. skim milk at 6 pies per lb.	Rs. 2 13 0		
Total	Rs. 5 10 0		3 12 0

The other economical ways of dispcsal of milk are as *koa,* ice cream, and sweetened flavoured cool milk drinks. These are worth a trial.

Cleanliness in the dairy. Absolute cleanliness is of vital importance in the dairy compound. Clean stalls, clean cows, clean milk-men and clean vessels ensure a clean and therefore safe food. Cleanliness in the dairy is brought about by the liberal use of water, washing soda, steam and the sun.

Records. It is too well known that a business cannot be conducted efficiently without records concerning all transactions as well as production costs. The dairyman who does not maintain a fairly accurate record of the amount of feed given to each cow and the amount of milk produced by it, is not certainly conducting business efficiently. All improvements of the herd by the use of good sires and sound feeding practices are based upon records. The following records are maintained in the College Dairy:—

Production records. These enable one to detect economic and uneconomic cows and to retain the calves from high yielders, and feeding according to production. Feeding by guess is always wasteful.

Feed records. Feed represents 50 to 60 per cent of the total cost of production and hence the importance of maintaining the record. A ration chart is prepared twice a month according to the requirements of the various classes of animals in the College Dairy.

Breeding and calving records. Cows should be bred so as to calve according to demands for milk. Every cow should be dried off and got into proper state for her next lactation. Unless the exact breeding date is known some cows may be milked too long while others dried off too soon.

Health records These reveal the various ailments of a particular animal Inoculations done against contagious diseases are also recorded.

Sale records A record of each transaction provides a valuable reference. Disputes and errors are often avoided. Accurate records create confidence on the part of the buyer and the seller as well. They help in preparing the trading, and profit and loss account.

Trading, and profit and loss account. The trading and profit and loss account consists of (1) a direct expenditure and (2) an indirect expenditure. The former includes such items as feed, labour, salary of staff, stores consumed, allowances and presents, transport charges on animals, postage and stationery, repairs to buildings, ice plant and boiler expenses. The latter includes interest on capital, depreciation on buildings, machinery, furniture, loss by sale of cattle, depreciation on animals, death, direction charges, audit fees, leave and pension of officers.

The following figures represent the expenditure and revenue of two years of the College Dairy.

Year.	Direct expenditure	Indirect expenditure.	Total expenditure.	Revenue.	Loss.
	Rs.	Rs.	Rs.	Rs.	Rs.
1939-40	8,176	3,666	11,842	11.255	587
1940-41	8,364	3,173	11.537	11 074	463

An examination of the various items of expenditure would reveal that all items under the direct expenditure are essential for the efficient working of the concern. A Dairy Manager on Rs. 130 and an Accountant on Rs. 80 have been included in the direct expenditure. A critical examination of the items under the indirect expenditure, however, reveal that out of a total of 3,000 and odd rupees a sum of Rs. 1514 is taken up by such items as, direction charges (part of the pay of the Superintendent) Rs. 442, audit fees Rs. 520, and leave and pension Rs. 552. If we delete this Rs. 1514 or a portion thereof from the total expenditure the situation is changed for the better. The over-head charges can also be reduced on account of the reduction in the size of the herd. The loss is then turned to one of balance if not a gain and the dairy beccmes a self supporting concern even while it serves to train students.

Acknowledgment. My thanks are due to Mr. R. C Broadfoot, Senior Lecturer in Agriculture and Superintendent, Central Farm, for permitting me the use of dairy records in the preparation of this article.

A Note on the Disposal of Inferior Quality Virginia Tobacco

By KALIDASU SANKARAYYA, Thumad, Kandukur Taluk.

While curing Virginia tobacco in any farm some inferior grades of leaves are obtained. Their disposal has become problematic this year much more than ever as shipments of this material to Japan, China, etc., have ceased. I wish to suggest an alternative use for this low quality leaf.

These are Guntur grades VII and VIII and consist of dead, perished and scorched leaf and immature green leaf picked which are locally known in Telugu as "*Gulla*", "*Madu*" and "*Moddu patcha*". Even when these grades were saleable the value of such grades was from Re. 1 to Rs. 10 per candy of 500 lb. That is to say the average price of a candy was Rs. 5. It has to be considered whether such an offer is justifiable. If any leaf is sold, it should fetch at least the cost of its preparation, i. e., curing, grading and packing. I wish to suggest a means that is more profitable indirectly than the sale of leaf for cash at Rs. 5 per candy of 500 lb. Manuring the lands plays a prominent part in agriculture and the main plant foods are nitrogen, phosphoric acid and potash. International commerce was put to a dead stop owing to the "World War" and no fertilizer is imported into India. Secondly, in the opinion of scientists organic manures are better than inorganic fertilizers. Tobacco leaf with its stem is a good organic manure.

As far as information is available, the manurial value of the flue-cured tobacco leaf is as follows :—(Werner—Tobacco Land).

Water ...	...	7·62	Magnesia ...	...	0·96
Nitrogen ...	...	4·37	Phosphoric Acid	...	0·50
Potash ...	...	5·74	Insolubles ...	...	1·94
Lime ...	...	5·43	Others ...	...	73·44
			Total.	...	100·00

With the help of the above data, I tabulate below the quantity of each plant food available in 500 lb. of leaf and the value thereof at pre-war rates so that it may be compared with the price offered in the market.

Main plant food.	Percentage available in leaf.	Plant food available in 500 lb leaf. (lb)	Rate per lb of plant food (pre-war).	Cost of plant food in a candy of leaf.	Remarks.
Nitrogen	4·37	21·9	0 3 3	4 8 0	N in Am. Sulphate.
Potash	5·74	28·7	0 2 3	4 1 0	K_2O in Pot. Sulphate.
Phos. Acid	0·50	2·5	0 3 3	0 8 0	P_2O_5 in Super Phos.
Total manure value per candy of leaf				9 1 0	

The manurial value excels the market value by about twice as much and the extra benefits of this manure are: 1) it is an organic manure which is the best of manures, 2) it benefits to the land the same year it is applied if well-rotten compost is prepared out of it, 3) it has its residual effects for three years at least. For the above reasons, I advise my co-farmers not to sell their low grade leaf unless the cost of flue-curing and sun-curing can be realized. It is no loss to a farmer at any time if it is not sold. It may be used as manure. There is the Agricultural Demonstrator to teach us how compost can be made solely with tobacco leaf or scrap or in combination with other organic substances to make a well balanced complete manure.

Insect Enemies of the Cashewnut Plant (*Anacardium occidentale*) in South India

By T. V. RAMAKRISHNA AYYAR, B. A., Ph. D.

Though an exotic species the cashewnut plant has gained a strong foothold in this country, especially along the coastal and submontane areas of the West Coast from the Cape in the South to almost as far as Bombay and in different parts of the Coromandel Coast. Due to great demand for the cashew kernels from outside countries, thousands of acres of waste land which have been left uncultivated till recently have been planted up with this tree and year after year new areas are planted up. This is a tree which is found to grow well in almost all kinds of soils, and especially in well drained rain fed hill sides and the sandy coastal tracts; it begins to bear well and give a good return in about six to eight years.

Prospective planters of this crop will, however, do well to bestow sufficient care and precaution towards the healthy growth of the tree free from diseases and pests to which this crop is frequently subjected. As the area under this crop is bound to increase year after year in proportion to the growing demand, the chances for pests and diseases to multiply are great, as has been the experience with crops like sugarcane and groundnut in S. India. While even in the case of several crops like those mentioned above, pests of minor importance in the old days have begun to assume the status of major pests, in perennial plants like mango, cashew or other trees such pests have greater chances of rapid multiplication and wider distribution when the area under the food plant increases rapidly and no attention is paid to these pests in the early stages. In this paper an attempt is made to give a brief account of the different insects associated with this plant, their bionomics as far as we know and a few suggestions towards their control.

Sucking insects. As in the case of most fruit trees it is during the younger stages of their growth that the plants are more subject to pest attacks. The more important of the insects which cause injury to the growing plant are insects of the sucking type which feed on the sap of the tender parts and cause fading. These include the following:—

The Tea mosquito (*Helopeltis antonii* S.) As the name indicates this is the notorious capsid bug associated with the tea plant in most of the plantations in S. India. This is a very active reddish brown insect almost like a mosquito. The insect has been known to tea and cocoa planters of Ceylon for nearly a century. The adult insect can be easily identified by the peculiar knobbed process projecting from the dorsal side of the thorax of the insect like a pin. The eggs are peculiar and practically thrust into the tender plant tissue by the mother insect; these hatch into minute, antlike active nymphs and after undergoing about four moults assume the adult stage. The thoracic knob is not found developed during the earlier nymphal stages. The nymphs and the adults cause damage to the plant by feeding on the sap of the tender leaves and shoots and allow these parts to fade and dry. In serious outbreaks the leaves and shoots dry up and the whole plant, if it is very young, almost succumbs to the attack. In South India this bug has been so far noted on tea and neem (*Azadirachta indica*) in addition to the cashewnut plant. This insect belongs to the same group and has the same habits as the mosquito bugs of sorghum and betel vine. The damage caused to the plant shoots often appear so serious that workers have often been led to suspect whether the insect does not inoculate some poisonous or irritating virus into the plant tissue.

The Cocoa thrips (*Selenothrips rubrocinctus* G.). This is a well known and notorious pest of Cocoa in different tropical areas ; it is a small thrips infesting the tender shoots and leaves in large colonies. The injury caused to the plant is more or less as in the case of the tea mosquito. Badly infested leaves turn reddish brown and gradually fade. The insect though provided with wings and capable of flight is a slow moving creature, has a dark reddish brown colour and is about $\frac{1}{4}$" in length. The entire body surface including the legs shows a closely reticulate surface fringed with minute bristles. Eggs are thrust into the soft tissues and the emerging larva is very characteristic of this species ; the body has a light greenish yellow ground color and over this there are bright red transverse bands across the first and last abdominal segments. Due to this characteristic coloring it is also known as the "red banded thrips". Though there is no cocoa cultivation in India the insect is found often as a major pest on cashew plant and occasionally on the country almond tree (*Terminalia Catappa*). This thrips has been noted by the writer as a serious pest in parts of Malabar, Cochin and S. Canara. Besides the red banded thrips, the writer has noted another species of thrips in company with the former on this plant in parts of N. Malabar. It confines its activities chiefly to the flowers. It was described as a new species by the writer in 1928 under the name *Rhynchothrips raoensis* F.

Scale Insects. Two or more species of these insects have been noted on cashew The fairly common species of scale found on this plant is the soft wax scale (*Ceroplastes floridensis* C.). Hundreds of these scales are found on the surface of tender leaves and shoots. In bad infestations the

infested areas fade and gradually become dry patches. Another species of scale occasionally noted is a soft scale *(Lecanium latioperculum* G.) which, however, is not a very important pest.

Biting Insects We now come to those insects associated with the tree which eat the leaves, buds, etc. These include leaf eating caterpillars, beetles and stray grasshoppers. Of leaf eating caterpillars, the commonest found especially along the West Coast area is the wild silk worm *(Cricula trifenestrata* H.); it is a stout reddish brown hairy caterpillar often found in swarms; the golden yellow hairy spiny silken cocoons of these caterpillars are sometimes found in masses on the tree branches. The moth is also a fairly large one with reddish brown wings. Among other caterpillars there is found a small pale white leaf miner *(Acrocercops syngramma* M.) During the stages when fresh shoots and leaves are given out this slender caterpillar, about $\frac{1}{6}$" to $\frac{1}{4}$" in length, produces pale whitish patches of blisters on the tender leaves, which curl up and dry. The moth is a small very delicate pale silvery grey insect. Another caterpillar is a slender elongated greenish species which folds and rolls up the foliage; but this is not such a bad pest as the leaf miner. Among leaf eaters a small dark weevil *(Apion amplum* F.) about $\frac{1}{8}$" long is often found nibbling the tender shoots and buds. It is not unlikely that further studies might reveal the association of other insects with this plant. It may be interesting to note that while all the other parts of this tree are attacked by insects the fleshy joint and the nut have not so far been found subject to their attention on the tree. The stored kernel is often found subject to the attacks of some caterpillar pests which generally attack dry fruits, oil seeds, etc.

In certain tracts like the coastal and submontane areas of Cochin and Travancore the tree, stem and branches have been occasionally found attacked by the grubs of stem boring longicorn beetles as in the case of mango, jak and other fruit trees; often stems and even trees are killed in bad infestations by the grubs of the beetles which are long, stout and fleshy worm-like creatures. Two species have been noted so far, viz. *Plocaederus ferrugineus* L. a medium sized brown coloured beetle from Cochin and another *Prionoma atratum* G. from Travancore.

Control methods Regarding control measures against these pests a few remarks may be added. Unlike as in the case of ordinary field crops like paddy, sorghum, etc., where, methods like spraying, dusting, etc., for pests are out of question, in the case of paying crops like fruits all modern methods whether mechanical or insecticidal are well worth introduction in orchards; in fact such methods should be included in the routine of fruit cultivation just in the same way as cultural methods like manuring, irrigation, hoeing, pruning, etc, etc. It will also be quite economic and practicable for orchardists in extensive areas to equip themselves with the necessary pest controlling apparatus and insecticides for their periodical use; else they can even arrange for stocking all such materials on a co-operative basis for the use of all fruit growers in any area. If modern methods of

spraying, etc., have any definite chances of success in India paying crops like fruits and industrial crops like cotton, tobacco, etc., are the ideal ones for such trials. For the sucking insects, especially thrips and the mosquito bug of this tree which constitute the main pests spraying the shoots with a contact insecticide like tobacco decoction after pruning badly infested shoots will be found economic and beneficial. For the leaf eaters which are not so bad, handpicking in time might alone be found sufficient; if, however, the attack becomes wide spread spraying or dusting with stomach insecticides will control the pest The control of the borer beetles is not, however, an easy job. Preventive measures have to be adopted in the shape of pruning and destroying early infested stems and branches, removing dead and dying branches and keeping the orchard clean. Direct methods in the way of removing or killing the grubs on the attacked trees by hooked wires, injection of petrol, etc., can also be adopted. Biological control may be very effective in some cases but the same will have to be always supplemented by the ordinary prophylactic and curative measures like spraying, dusting, etc. And as far as the pests of this tree are concerned no effective natural enemies have been discovered as yet.

SELECTED ARTICLES

Rabies and its Control in India.

By M. R. SHARMA, L. V. P., P. V. S.,
Civil Veterinary Hospital, New Delhi.

Rabies is one of the oldest known diseases. It is found in nearly all parts of the world and in all climates. It has not so far been introduced into Australia or New Zealand and has been stamped out of the British Isles by the destruction of all animals infected with the disease, or suspected to be so infected, by the muzzling order, and by strict quarantine regulations concerning the import of dogs. Once the symptoms have developed, it ends fatally almost always. It is also a source of imminent danger to human life and domestic animals, causing considerable economic loss.

To apply suitable measures of control against this disease it is essential as in the case of many other diseases, to have a thorough public awakening.

Rabies is primarily a disease of wild and domesticated canines, e. g. dogs, jackals, foxes and wolves, but all the warm-blooded animals like cattle, horses, goats, sheep, cats, monkeys, rabbits, camels, elephants, fowls and human beings are susceptible. Infected canines particularly pariah dogs, so widely and extensively distributed in India, spread the disease among themselves and other susceptible animals and human beings. The mongoose and blood sucking (Vampire) bat have been reported to act as a natural reservoir of rabies virus in South Africa and South America respectively and to convey the infection to domesticated animals and human beings; but in India the virus is usually maintained by wild carnivores and stray dogs.

Cause The causative agent of this disease is a virus which passes through bacterial filters and is not visible even with the aid of the microscope. Desiccation, heat, sunlight and antiseptics adversely affect the virus, but glycerine acts as a preservative, as is the case with most of the viruses. The virus is destroyed by exposure to a temperature of 60°C, for half an hour or by the ordinary disinfectants.

With the bite of an infected animal the virus which is present in the saliva, even 10 days before the onset of the symptoms, is injected into the victim. The quantity of the virus thus injected depends upon the depth and number of bites and presence or absence of clothes and hair covering the skin. Crushing of soft tissues caused by the bite of a rabid dog produces a favourable environment for the propagation of the virus and its penetration into the nerve trunks and transmission to the brain and spinal cord. Besides saliva, the urine of a rabid dog is also infective. Rarely may the disease be acquired by infective saliva or urine coming into contact with the eye. The virus of a natural case produces inconstant results and is called 'street virus' to distinguish it from its modifed form known as 'fixed virus' which is obtained by serial passage through rabbits and produces constant results in them on inoculation. The latter is chiefly employed in the manufacture of vaccines.

Symptoms in dogs After the introduction of the virus into the tissues of the victims, some time must elapse before the symptoms of the disease appear. This period, known as 'the period of incubation', varies with the species, site and character of the bite, and the quantity and virulence of the injected virus. It usually ranges from 15 days to 6 months in dogs, 15 to 60 days in cats, 10 to 45 days in horse, 14 to 60 days in sheep and pigs and 14 to 64 days in human beings. Cases are on record of much longer periods extending even up to two years. It is shorter in young animals and also when infection has taken place near to the head.

As the virus affects principally the nervous system, the symptoms are associated with nervous derangement. In a typical case three characteristic stages of melancholy, excitement, and paralysis are observed. But in dogs one should not expect all the usual symptoms to be present in each case. In some cases, particularly of small pet dogs, the stage of excitement is usually so short as to pass unnoticed, and paralysis, especially of the jaw and hind limbs, sets in early (dumb rabies). In others, especially dogs of larger breeds, the stage of excitement is very pronounced and the ultimate paralytic symptoms are delayed (furious rabies). However, there is no fundamental difference between the two forms.

In the preliminary stage usually there is some alteration in disposition or habits. There may be unusual display of affection or the animal may turn morose, hiding under furniture or in corners and not usually responding to the owner's call. The eyes have a vacant look and the pupils are dilated. There is mental delusion and the animal snaps at imaginary objects, becomes restless, with a tendency to start at the slightest sound. Salivation is increased and the appetite becomes morbid, refusing ordinary food, but eating straw, wood, carpets, leather, stones, etc. There is a characteristic change in bark and there may be a rise in temperature and sometimes constipation. This stage usually lasts about two days and the animals may then develop either of the two forms mentioned above.

In the 'furious' form the animal will try to bite anything within reach such as its chain, metal bars or the woodwork of the cage, thereby causing injuries to its mouth. If the animal is loose, it runs about aimlessly for miles, biting anybody coming in its way and may engage in fights with pariah dogs thereby spreading the infection. Salivation and mental delusion are increased. There is great desire for water and the animal is unable to bark well and the voice is somewhat between a howl and a bark. Later on in the aggressive stage, the animal may even become dumb and attack others in silence. Appetite is usually suppressed and the animal bites its own body. In about three to four days paralysis sets in, affecting the jaw and limbs. The dog loses the power, but not the desire to bite. One has not to wait long to see the end of the affected dog, which occurs in seven or eight days unless it dies earlier due to exhaustion.

In the 'dumb' form the preliminary stage of melancholy is comparatively short, and is soon followed by signs of paralysis, there being practically an omission of the 'furious' stage. The jaw muscles and the tongue are the first to become paralysed with the result that the lower jaw drops, the animal cannot feed and salivation increases. There is no desire to bite, paralysis gradually extends to the hind and then to the fore limbs. The dog becomes comatose and dies in two or three days.

Other domesticated animals. The symptoms described above are more or less common to other domesticated animals which usually get the infection through the bite of a rabid dog. Affected cattle show general uneasiness, disposition to do damage, straining, stamping, bellowing, frequent attempts at micturition, sexual excitement and dribbling of saliva. This results in exhaustion and great loss of condition followed by paralysis of the hind and fore limbs. In some cases the excitement stage is short and paralytic symptoms appear earlier. Death usually results within five days of the onset of the symptoms. Similar symptoms are observed in affected goats, sheep and swine. During excitement they become aggressive and attack practically any class of animals, even dogs. An affected horse becomes excited and aggressive, walks round and very often bites his own body, especially the site of infection. The writer has met with two such cases, wherein the history and symptoms given by attendants were such as to give all reasonable suspicion of colic. But on a careful examination, both the cases were found to be of rabies. So one should always be very careful in handling any suspicious cases like these. There is increased sexual excitement and frequent micturition. Thirst is marked although there may be some difficulty in swallowing. The excitement stage results in paralysis affecting the throat and hind limbs. In fowls, the bird shows signs of conspicuous fright and unrest. It runs in circles with ruffled feathers, frightened look and hoarse cries, attacks the healthy birds and even human beings with the beak. Ultimately paralysis sets in, followed by death.

Hydrophobia. In man three stages of the disease are recognized. The first stage is of general malaise which is characterised by pain at the site of infection even if the wound is healed up, stiffness of the limbs and joints, rise of temperature, headache, general uneasiness and disinclination to drink. The patient does not sleep well and experiences spasms in the throat when he tries to swallow. This gradually passes on to the second or hydrophobic stage during which the spasms increase and become extremely severe even at the sight, or suggestion of water. There is actually fear of water (hydro-phobia). There is increased salivation and nervous irritability, accompanied by screams, fits of madness and convulsions. Sometimes the patient becomes aggressive. This causes rapid emaciation and passes on to the third or paralytic stage during which general paralysis and respiratory distress due to paralysis of the diaphragm are observed. This stage is of short duration and is very soon followed by death. The writer saw a case of rabies in a child about 11 years of age in the winter of 1940. The child developed rabies, even after going through a course of anti-rabic treatment immediately after the bite and showed all the typical symptoms of the disease.

Diagnosis. The usual history of a bite from a dog and the presence of a bite wound in addition to the symptoms mentioned above, should enable one to identify a case of rabies. It is advisable not to destroy a suspected case of rabies, but to keep it under observation in a suitable isolated place and allow the disease to take its natural course. This assists in arriving at the correct diagnosis. A rabid animal almost invariably dies within 7 to 10 days from the onset of symptoms. To catch a rabid dog alive especially a furious case, with minimum risk is a difficult problem. For this the use of a suitable catcher is recommended.

In the carcase of a rabid dog one may find signs of salivation, soiled tongue injuries to the mouth and even broken teeth, resulting from biting at and ingestion of foreign bodies. These may be found in the stomach which may show haemorrhages. The feet may show signs of the animal having travelled long distances. However, to arrive at a definite diagnosis it is essential to send the brain of a suspected animal for microscopic and biological examination to the Pasteur Institute, Kasauli or some other laboratory doing similar work. Only a veterinary surgeon should undertake the removal, preservation and despatch of the brain of a suspected case. In microscopic examination a positive diagnosis is based on the presence of peculiar structures known as 'negri bodies' which are found in certain parts of the rabid brain. Although a positive diagnosis by this method is reliable, a negative diagnosis is not necessarily correct and in such cases, one should rely entirely on the clinical diagnosis given by the veterinary surgeon. The result of the biological examination depends upon the ability of the suspected brain material to infect rabbits, which develop the paralytic or 'dumb' form of rabies without showing any furious symptoms and die within 27 and 10 days from the date of inoculation in the case of 'street virus' and 'fixed virus' respectively. To wait for 27 days for the results of a biological test for recommending anti-rabic treatment of human beings or pet animals exposed to bites from or contact with an animal suspected to be rabid is extremely risky. On the slightest suspicion of rabies it is advisable to recommend their vaccination without waiting for the results of the laboratory tests.

Similarity to other diseases. Although the disease may be confused with nervous diseases like epilepsy and hysteria in dogs, encephalomyelit is in horse and cattle, the history and the symptoms described above enable one to differentiate these conditions without much difficulty. In epilepsy and hysteria the attacks are repeated and not continuous and the animal does not die eight or ten days from the onset of the symptoms Mechanical injury to the jaw may cause dropping of the jaw similar to that seen in rabies, when the jaw is paralysed. Foaming at the mouth and frenzy caused by a foreign body in the roof of the mouth should always be handled with due precaution, as the existence of a foreign body in the mouth does not exclude the possibility of rabies, but on the contrary it increases the suspicion. There are certain other conditions like the nervous form of canine distemper, intestinal worms, foreign bodies in the rectum, which may produce certain nervous symptoms resembling those of rabies, but an experienced veterinary surgeon would find no difficulty in differentiating these conditions from rabies.

Prevention and control:— Rabies is primarily a disease of dogs, which spread the infection to other domesticated animals and human beings by means of their bites, and again it is the dog that while fighting or hunting wild animals like wolves, jackals and foxes brings the infection, although these wild animals may sometimes directly bite human beings and domesticated animals in the jungle. Therefore the control of the disease lies principally in controlling it amongst dogs. Complete eradication of the disease from India, where it is widespread, is perhaps impossible on account of geographical difficulties and the presence of wild carnivores and innumerable stray dogs which would keep the virus alive.

An attempt should be made to minimize the chances of the spread of the disease by the destruction of ownerless dogs, licensing of other dogs at least in municipal areas and restriction of the liberty of dogs, unless muzzled, to premises of the owners. To judge what can be achieved by the muzzling order one has only to glance at the statistics of Great Britain. Muzzling was begun in 1890, and the cases of rabies went down from 129 to 38 in 1892. When in response to public feelings the orders were relaxed, the result was that cases rose from 93 in 1893 to 672 in 1895 In 1895 the muzzling order had to be re-enforced with the

consequence that incidence of the disease went down, until between 1903 and 1907 no case of the disease was reported. It was about 1933, when the writer was working in Simla, that a great number of cases of rabies occurred there among dogs. The writer recommended the enforcement of the muzzling order and the results were most satisfactory. Free prophylactic vaccination of dogs with a suitable vaccine once a year preferably at the time of issuing licenses should also be introduced With these measures the disease can be effectively controlled and its incidence immensely diminished in this country. Expenditure on prophylactic vaccination of dogs would be amply compensated by reduction in the cost of anti-rabic treatment of human beings. Unwanted pups should also be destroyed and the destruction of wild carnivores, such as jackals, wolves and foxes should be encouraged as far as possible. Bitches in season should not be let loose, so that dogs do not assemble and engage in fights facilitating the spread of infection. All dogs in contact with or bitten by a rabid dog and those newly imported into a locality should be muzzled and kept under proper control for a period of six months even if anti-rabic treatment is given.

Destruction desirable. It is highly desirable to destroy all animals bitten by rabid dogs and to discourage curative vaccination, particularly when the animal is badly bitten, especially round the head as such dogs may develop rabies even if vaccinated and may thus be in an infective state before the completion of the process of immunization and therefore a source of danger to the owner, his family and attendants. Sometimes infection with a more highly virulent strain of virus cannot be suppressed by vaccination. The treatment thus creates a false sense of security. If in the case of valuable pet animals, it is desired by the owner to have anti-rabic vaccination carried out in spite of the above mentioned risk and expense, it is necessary that the bite should be thoroughly disinfected and cauterized The vaccination (curative) may be carried out at the nearest veterinary hospital with a vaccine issued by the Pasteur Institute or any Government veterinary Institution in India. The usual time available for treatment after infection varies from 17 days for individuals bitten on the head to a period of two or three months for bites on the lower extremities. During this incubation period of 'street virus' active immunization with 'fixed virus' incorporated in the vaccine should be carried out with a view to aborting the infection. It is curative in the sense that it extinguishes the infection. The sooner this protective vaccination is undertaken after exposure to infection the greater will be the chances of success.

It should be made legally binding on the owner or person in charge of the animal infected with rabies or suspected to be so infected to report the matter to the local veterinary or public health officers. It is necessary that the carcases of all such animals should be properly disposed of either by cremation or deep burial with a layer of lime and the premises, fitting, utensils, etc., should be thoroughly disinfected.

Preventive vaccine. The prophylactic or preventive vaccine referred to above is of the greatest importance in the control of this disease in the country like India, where it is widespread. The experience gained in this method of control by other countries where similar conditions exist is worth mentioning here. In Japan out of approximately 260,000 dogs vaccinated by the method of Umeno and Doi, only 169 contracted the disease during the year following vaccination, while 5.881 cases occurred among the unvaccinated dogs. It has further been shown that a significant decrease has occurred in the number of persons bitten and in the number of deaths from rabies after systematic vaccination by this method. Similar claims with regard to the reduction of the incidence of this disease by use of this vaccine have also been made by workers in the U. S. A.

In selecting a suitable vaccine one should see that it is:

(1) Efficacious (early conferment of durable immunity after vaccination).

(2) Safe (properly attenuated, producing no injurious effects such as the development of the disease or post vaccinal paralysis, etc.).

(3) Easy to manufacture

(4) Easy to use (one-dose vaccine preferable to others).

(5) Of fairly long keeping quality (to enable transhipment in a potent state, from the place of manufacture to far off places).

Umeno and Doi's single dose vaccine (glycerinated carbolized) referred to above fulfils these conditions, but its manufacture and quality have yet to be tried in India using the local strain or strains of the virus and with such modifications as may be necessary to suit local conditions. In the absence of this vaccine the following vaccines which are available in the market and have been extensively used by the author with satisfactory results are recommended:—

(1) Anti-rabic vaccine prepared at the Central Research Institute, Kasauli.

The oldest method is that of Pasteur which consists of a number of injections, usually seven with a 6 per cent brain emulsion prepared from sheep's brain with ¾ per cent carbolic. The writer has used this method both as curative and prophylactic for years with encouraging results. Post vaccinal paralysis has been reported in certain cases by others, but I have never come across one in my many years' experience. The immunity lasts for six months.

(2) Mulfor's rabies vaccine prepared in America.

It is chloroform killed rabies vaccine containing 33⅓ per cent of rabid brain and cord tissue. This is a single dose treatment and the immunity is claimed to last for a year. The writer has carried this out on a large scale for years with very good results.

(3) Anti-rabic vaccine prepared at the Punjab Veterinary College, Lahore.

It is a simple and suitable vaccine prepared from an emulsion of a rabbit's brain and consisting of a 2 per cent brain emulsion in normal saline with carbolic acid —*Indian Farming*, Vol. 3, No. 4, April 1942.

Agricultural Engineering in India.

By M. VAUGH,

Agricultural Engineer, Allahabad Agricultural Institute, Allahabad.

Who is an agricultural engineer? By American practice the term is applied only to those who have pursued a definite course of training in engineering and its application to agriculture. In England, apparently so far as I can judge by literature coming to me, an agricultural engineer is one who is engaged in the marketing of agricultural implements or in their manufacture and the term does not depend on what training the individual may have had, if any at all, other than experience. So far as I can determine, in India the term is applied to any engineer without regard to the branch of engineering in which he may have been trained who is assigned to a post carrying the title of 'Agricultural Engineer' usually in Government service.

Early experiments. The early agricultural departmental organization made no provision for agricultural engineering. The men appointed were administrators from the civil service, biologists and plant breeders, or agriculturists Many of them were exceedingly capable men and laid very fine foundations for the splendid work which has been done since. None of them was an engineer and indeed the idea of the Agricultural Engineer, had not yet emerged in the west.

While the early officials of these newly created Agricultural Departments were not primarily trained to deal with implements, they interested themselves early in the introduction and trial of foreign implements, particularly iron ploughs. N. G. Charley, in his excellent paper presented to the Crops and Soils wing in 1937, makes reference to some of the early introductions about 1882 to 1885. Collectors and private individuals also experimented with imported and locally made ploughs and other implements.

Perhaps the improved device which has been most widely adopted throughout India and which has more effectively than any other displaced the indegenous method is the iron roller sugarcane crusher. The exact history of the iron roller crusher seems shrouded in mystery. This is perhaps the most outstanding instance of an agricultural engineering improvement developed by manufacturers and dealers in India.

Aside from the cane crusher, the one other thing which seems to have spontaneously taken hold over a large part of the country is the small chaff-cutter. Originally imported from England, it has in recent years been manufactured in large numbers by a number of different firms, particularly in the Punjab but elsewhere also. After a period of very poor machines, it appears that public demand is now stabilizing on a machine of reasonably good quality, and competition between firms is keeping the price as low as is consistent with the quality demanded.

The Indian Plough. Various people have in the past reviewed the development of ploughs in India. N. G. Charley in his paper in 1937 dealt with the history of the improved plough in India at some length.

Local factors favoured the adoption of cast iron ploughs in India, factors having nothing to do with the merits of cast iron for the purpose. The process of fabrication was simple. A little sand moistened with the water could be shaped into the mould and used repeatedly. Cast iron in the form of new pig and in the form of scrap was more easily available than steel. With a pit furnace, little more than a hole in the ground, a hand-operated fan which could be and often was made locally, a supply of coke and a crucible which while imported was not very costly, a foundry could be set up. Foundry skill is relatively simple as compared with the working of steel. A few months' working in an engineering workshop where casting was done was sufficient training for a moulder to start work. The amount of hard labour required was much less in the case of cast iron parts as compared with the making of steel parts by hand. The forming of steel by machines was only developing in the west and there and in India as much as possible of all machines was still made of cast iron. The advantage of cast iron was particularly great in the case of parts of complicated shape.

It was natural, therefore, perhaps all but inevitable under the conditions, that the Agricultural Departments should standardize on cast iron ploughs. In many cases, however, the cultivators refused to use the cast iron shares, having poor ones made of steel by their own blacksmiths when the Department failed to furnish steel ones as desired. It was natural that early manufacturers should look to the Agricultural Departments for help in getting sales and from this it was only a step to the Departments undertaking the sales directly through departmental agencies. To the Departments this appeared to have advantages, they were thus able to control types offered to the public according to their views of what the public should want; they were able to control prices, allowing the maker such profit as they thought fit and in some cases absorbing the cost of sales in the departmental accounts, making the price to the cultivators low indeed, but thereby cutting out the possibility of independent competition with them.

Private enterprise. In some parts of India, these conditions did not exist. Kirloskar Brothers, starting with the manufacture of a chaff-cutter, soon added ploughs, copies of models which had some measure of local acceptance if not popularity. They made arrangements for local stockists and for repair service and they pushed the sales as a business. As demand grew, they improved the quality and finish of their implements and added new models from time to time to meet additional needs. In contrast to this, I am convinced that the hold the Departments in other provinces have had on the trade in implements coupled with the insistence on the sale of what I consider unsuitable types of ploughs, has resulted in not only not fostering the introduction of better implements but actually delaying such introduction. At least so far as North India conditions are concerned, designs distributed have often been faulty in that they only provided often inadequately, for one part of a season or operation and did not fit in well into the whole series of operations necessary to produce a crop; material has often not been the best available, quality and workmanship have often been sacrificed to cheapness (low first cost has been made a veritable fetish in some cases, without regard to ultimate costs or to efficient working). In fairness to agricultural engineers, it should be stated that little of this condition is their fault.

Suggestions for the future. The first suggestion I would make for the future development of agricultural engineering in India is the urgent necessity for training agricultural engineers in India for Indian conditions.

In other lines of work we employ specialists trained for their job. It would be no more absurd to employ a chemist to do research in plant breeding than it is to employ a civil engineer trained to design and construct canals, roads and buildings, or a mechanical engineer trained in the operation of big power plant or in manufacturing methods, to conduct research on improved implements or their application to agricultural practices. Doubtless sound scientific training in any subject is a help in mastering any other and it is also true that a soundly trained science graduate given sufficient time, should be able to master after a fashion an unfamiliar branch of science but the practice of employing specially trained men is too common to need more emphasis here.

A sound professional training in agricultural engineering should include three phases. First, it should include a sound basic training in agricultural principles, particularly the knowledge of chemistry, botany, soils and animal husbandry, necessary to understand the fundamentals of plant growth.

Secondly, it should include a sound training in engineering fundamentals and processes. It should cover such subjects as manufacturing methods, particularly those applying to the manufacture of implements along modern lines, engineering drawing and structural design including special attention to design of agricultural buildings, a sound training in mechanics and statics, elementary training in electricity and its application particularly to motors and to distribution systems for rural electrification, and the applications of engineering principles to the construction and operation of agricultural implements and machinery as engineering devices.

Thirdly, the training of agricultural engineers including some intensive training in the application of engineering principles should be kept in mind at every stage While the engineering training should be sound engineering, it should not be taught abstractly but as an applied science.

Some real difficulties:— There are certain real factors in the situation of the cultivator which are very great difficulties in his way. While he may not be excessively conservative as an individual, it is true that religion and social custom are against change. Indian social life in general is built around group control

and does not encourage innovations. The individual is not free to do as he pleases in many phases of his life. At least in North India the zemindari system has often been a brake on progress, the zemindar tending to take in one way or another any benefit accruing from any innovation in crop or practice and quite generally discouraging innovations.

The mistake of failing to understand and utilize the *jajmani haq* system under which indigenous implements and tools are made and repaired, has been a deterrent to the introduction of better ploughs in many cases.

My first suggestion for the future is that a thorough study be made of the social customs, village organizations and economic factors which may affect the introduction of implements.

The second suggestion is that agricultural engineering research be on a more comprehensive scale than hitherto. We should not set out to develop a small soil inverting plough but rather to study the problem of seed bed preparation throughout the year.

My third suggestion is somewhat related to the above. We should give more attention to long range objectives in planning our research programme for implements. Of course we say that our objective in all our agricultural improvement work is to raise the standard of living of the cultivator. So far so good, but that is very general and not very definite. Some much more deginate and immediate objective would be conducive to more definite results. Just as we should not too closely restrict our objective, we should not be too diffuse. Possibly in recent years we have been frightened by the spectre of unemployment and have been unwilling to face the real objective of the introduction of better implements, *the better utilization of human labour.*

In fact, the first ganeralized objective I would suggest would be the working out of such a combination of improved implements and cultural practices as would reduce the need for the large amount of casual seasonal farm labour now required, particularly the necessity of employing large number of women and children in field work.

Technical suggestions. First, I would point out that research should be directed toward developing implements which can be utilized on areas approximating those now available to the larger cultivators in each area.

Secondly the power for working the implement is equally as important as the implement.

Certain problems needing investigation have been mentioned as illustrating principles or statements made. The following is a suggestive list of investigations which in my opinion need to be carried out, keeping in mind the principles laid down above. It is not meant that this list is exhaustive or complete but only suggestive.

1. The relation of improved implements to soil fertility particularly in relation to dry weather ploughing and to green manuring.

2. A full investigation of the problems of fodder production and storage under village conditions, including particularly the possibility of making silage.

3. The problem of harvesting, both of *kharif* and *rabi* crops. Possibly next to weeding and interculture, the harvest is the operation which makes the biggest demand for seasonal labour.

4. Improved methods of threshing, winnowing and grain dressing should give a substantial increase in the income of the cultivator.

5. There is real need for a device for lifting water efficiently for small lifts.

6. The present persian wheel is a great improvement on the old wooden one with grass ropes and clay pots. For shallow depths, it works fairly well but in deeper wells wear on the chain is very severe. There is need for a better chain

for carrying the buckets and possibly for better bearings. There is need for the investigation of the possibility of better gearing, arranged for separation from the chain wheel so that it can be used for other purposes

7. Attention needs to be paid to the possiblity of using bullock power for some of the power needs requiring rotary power

8. A rich field for investigation lies in the whole subject of soil and water conservation.

9 Transportation of crops from field to farmstead and from farm to market in head loads is one of the very large wastes of agricultural labour.

10. What is the need and what is the possibility of farm fencing in India

11. While any extensive rebuilding may have to wait for some rise in the standard of income, it is not too early to begin survey studies of the building needs of the cultivators.

12. Agricultural engineers should take greater interest in developing equipment for the dairy industry, particularly for the use of the *gowalla* and small dairyman.

13. The making of new equipment available to the cultivator is equally as important as the designing and manufacture of it. Many things like smaller implements are suitable for individual ownership Larger machines, more complicated machines requiring more training or skill for operation or requiring repairs outside the skill and facilities of the village blacksmith will, in the beginning at least have to be made available otherwise. Agricultural engineers should study and where possible experiment with solutions to these problems. (*Indian Farming* Vol. 3 No. 5, May, 1942.)

ABSTRACTS

Suitable procedure for laying out experiments in the fields of cultivators. T. G. Rama Iyer. *Mys. Agri. J.* 20: 109: 1942. Realising the practical difficulties such as the conservativeness, extreme cautiousness and a saftey first motto in the farmers, in the way of putting the results of agricultural research into practice the author finds that in the Mysore Agricultural Department formation of Subvention Farms, followed by Demonstration Plots which in turn are followed by Seed Farms has been found to work satisfactorily.

"The subvention farm is a small experimental farm of an acre or two in the holding of a leading and progressive *raiyat*. The several improved varieties of cane or paddy or cotton or groundnut of this State as well as from the adjoining Provinces are sown or planted along with the local in equal plots in a more or less uniform field selected for the purpose. The Departmental Fieldman supervises sowing or planting. The *raiyat* carries on cultivation according to his usual method. At the time of harvest the Fieldman again watches the operation and all inquisitive *raiyats* also watch the separate heaps harvested from the separate plots of the several varieties. The owner of the Subvention Farm naturally discusses the merits of individual varieties for earliness, yield, water requirements and the trouble and labour involved. He and his neighbours are then asked to select the best variety that suits their tract of country. They do so and there has been no occasion for any differences with the Department as the pros and cons of each variety are discussed with us also. The owner of the Subvention Farm is then paid a subvention of Rs. 100 per acre for sugarcane, Rs 50 per acre for paddy, Rs 25 per acre for a dry crop for his trouble and attention. The seed is given free and the *raiyat* takes the whole crop. It has been found that the Subvention Farm has a high educative value. The *raiyat* is trained to compare the merits of different improved strains from all points of view. The working of the Subvention Farms is under the control of the Botanical (Plant breeding) section.

Once the local *raiyats* are convinced of the merits of a particular improved strain in the Subvention Farm, then a large number of Demonstration Plots are laid in the holdings of different raiyats in the locality, the improved seed being supplied free for about one-quarter to half an acre. Smaller Demonstration Plots make it easier for a *raiyat* to see side by side at a glance the difference between the improved and local strains than Demonstration Plots of bigger size. It also enables the Department to lay out a large number of Demonstration Plots at a very low cost, the only expenditure to the Department being free seed. The *raiyats* watch the several demonstration plots.

Thereafter the demand for improved seed grows enormously. One of the best *raiyats* in the area is selected and he is asked to grow a Seed Farm of 10 to 20 acres to serve the needs of that zone. He is given good seed as an advance which he returns with 10 per cent addition at the time of harvest. The rest of his crop is purchased for seed according to agreement at 10 per cent above the market value for seed."

This method of intensive work carried on in paddy has now been extended into a definite five year plan. The author is of opinion that "in the case of commercial crops work done on similar lines will not give proportionate benefit to the *raiyat* unless the work of the Agricultural Department ends in a large-scale State controlled scheme for processing and marketing like sugar factory, ginning and pressing factory for cotton, curing and grading stations for tobacco, sheep breeder's associations, poultry associations, bee-keeper's co-operative societies and the like. If similar arrangements are not provided, there is danger of the work sliding backwards and of the *raiyats* not getting the economic benefits of agricultural research." These methods are recommended for use only in the case of backward *raiyat*, and not the progressive one. As a result of pursuing this policy the value of the seed sold by the department has increased over tenfold in five years. In 1941–42 the total number of Subvention Farms, Demonstration Plots and Seed Farms laid out are 189, 4,931 and 599 respectively for all crops. Appendices giving the different varieties of crops sown in the Subvention and Demonstration Plots are given. N. K.

A brief note on the cultivation of *Jola* (Sorghum) in Mysore. T. Srinivasa Murthi, *Mys. Agri. J.* 20 : 11 : 1942. *Jola* is the third staple cereal of the State next to *ragi*. Commercially it is more important than *ragi*. Between 1913 and 1937 an average of 322,297 railway maunds were exported annually. The acreage under this crop is very fluctuating, an average of 644,383 acres being recorded for a period between 1905 and 1937. The average production for the past 33 years is 1,071,283 *pallas*.*

The crop is of greater importance in the northern districts of the State (Chitaldrug and parts of Shimoga) as a staple food crop and as an important fodder crop in the south (Mysore district). Except in Malanad it figures all over State in mixed cropping.

There are two definite tracts in the State. The *hingar* tract with a rainfall of 18 inches has about 300,000 acres and mainly confined to the district adjoining the black cotton soil tract of Bombay and Madras Provinces. The crop is grown pure. The prominent variety is the white or *Bili Jola*. There are three important varieties of this (1) black glume (2) red glume with sweet stem and early (3) white glume with pithy stem and soft grains. In grain size they are distinguished into (1) *Sanna bili jola* (2) *Dodda bili jola* or *Mara jola* (3) *Sakkara jola* with small wrinkled sweet grains (4) *Kabbudantu*, sweet stemmed. The chief sowings are done in September—October. A fodder crop either irrigated or rainfed and either pure or *akkadi* sown is also grown.

* One *palla* of sorghum grain weighs about 2 lb.

The second tract *Kar* or *Mungar* tract comprises of over 220,000 acres and confined mostly to the Mysore district. It is important only as a fodder crop here. The chief varieties are *Kaki jola* with chocolate coloured grains and *Vogaru Jola* a purely fodder variety. The sowings are done in April and May. In the black cotton-soils of this district the white variety again makes its appearance. The varieties are *Muddaga* (compact ears), *Aremuddaga* (semi-compact) and *choliga* (loose). N. K.

Gleanings.

Vitamin B_1 in Buds of Trees. Large quantities of vitamin have been found in the buds and leaves of many common American trees by Prof. P. R. Burkholder and Prof. E. W. Sinnot. Using a constant temperature tissue culture laboratory, they found heavy concentrations of the substance in the buds of oak, red maple, horse chestnut, elm, sycamore and white pine trees. Although vitamin B is now produced by synthetic chemical processes this discovery points to a large natural source of vitamin B_1 and this finding may offer a clue to the source of essential vitamins for many forest animals, according to Prof. Burkholder. The vitamin seems to be formed in the young leaves and growing points of the shoot, whence it is transported to the roots and various portions of the plant.

Experiments in which basswood and maple trees were ringed in the spring show that almost no vitamin B_1 has appeared below the ring in midsummer. Yet huge quantities of the vitamin have been found above the ring. This seems to indicate that ultimately a ringed tree may die not only from lack of food but also from vitamin starvation. These researches show that most green plants contain sufficient amounts of the vitamin for their normal growth. The amount of essential minerals in the soil and sunlight apparently influence the amount of B_1 which green plants are able to produce. Vitamin B_1 is heavily concentrated in the buds, according to Prof. Burkholder, just as it is in grain.

(*Nature* Vol. 148: 466; October 18, 1941.)

Blackening of Potato Tubers on Boiling. It might be of interest to state one or two facts which may have some relation to the hypothesis advanced by Miss Ursula M. Robison that the blackening of potato tubers on boiling is caused by the black oxide of iron produced by oxidation from ferrous iron liberated from a loose complex, probably in association with proteins, as the result of hydrolysis on boiling.

From an examination of potato samples derived from about forty modern replicated fertilizer experiments, designed in association with Dr. E. M. Crowther of Rothamsted Experimental Station, I found that the typical grey to black discoloration which develops after boiling was confined to tubers grown on potash deficient plots in association with a relatively high nitrogen level in the soil.

It has been shown by various workers that in potash starved plants the amino acids increase relatively to the protein, and it has been suggested that this is due at least partly, to the breakdown of protein in the prematurely ageing plants. These changes may cause an abnormal distribution of iron in potash deficient plants and produce a greater concentration in potato tubers. Hoffer has shown that maize plants grown under conditions of potash deficiency do accumulate iron compounds in the node tissue and that the tissue develops a dark purplish brown coloration and breaks down. He actually developed from this observation a method of diagnosing potassium deficiency in the soil based upon the application of an acid solution of potassium thiocyanate to the nodule tissues of corn stalks when cut open lengthwise.

It would have been interesting to know whether Miss Robison found any significant differences in the potassium content and in the potassium iron ratios between normal tubers and those that went black after boiling.

(*Nature*, Vol. 148: 235; September 6, 1941.)

Work on grafting and vegetative hybridization (*Jarovizacija*, 1940, No 5(32): 141—43.) A. V. Jafaev made grafts of pea upon lupin, broad bean and *Cicer arietinum*; seeds obtained from the scions were sown and grafts made from the seedlings again on the same rootstock to effect vegetative rapprochment. Crosses will then be made between the scion and stock.

N. Petrosjan grafted the tomato Budennovka on the Epicure potato; the fruits formed on the scion differed from those of the control and the seedlings obtained from them also showed some resemblance to Epicure. (*Imp. Bur. Pl. Breed. & Gen. Pl. Breed. Abst.* 1941, Vol. XI, No. 4 : 270 : 908.)

Determination of albumen content in seeds of leguminous and oil plants with the help of colorimetric method. (Ivanov, N. N. and Dodonova, E. V. *Proc. Lenin. Acad. Agric. Sci. U. S. S. R.* 1940, No. 20 : 23—26.) The method is applicable to cereals as well as legumes and oil plants. Finely ground flour (0 5--0·8 gm.) of the particular cereal is mixed with 3—4 gm. of sand and triturated with 0·2% NaOH in 50% alcohol. The extract is filtered through cotton wool and to 10 ml. of solution are added 1 ml. 30% $CuSO_4$, whereupon the mixture is shaken and centrifuged for 3—5 minutes. The colour of the solution is compared in a colorimeter with standard solutions obtained from flours of known composition and gives the protein content of the flour.

For leguminous seeds a 5% solution of NaCl containing 0 2% NaOH is used as the solvent, and for oil seeds this same solution is used warm, with the later addition of a little ether, or alternatively an excess of NaCl and $CuSO_4$. The results obtained by this rapid method have been in close agreement with those obtained by Kjeldahl's method, even in lupins, where the presence of alkaloids has not in any way interfered with the determinations. (*Imp. Bur. Pl. Breed. & Gen, Pl. Breed. Abst.* 1941, Vol. XI, No. 4.)

Press Note.

Bee-keeping as a Cottage Industry. Bees are one of the most fascinating creatures of the insect world. Their habits are very interesting and instructive. They are useful in two ways. Firstly they give us honey and secondly they effect cross pollination in flowers, a process most vital for increased production of fruit crops. The useful role they thus play in agriculture is, however, little appreciated by the *ryots* in general. Honey is recognised to be the most easily assimilable food and is therefore specially recommended to infants, invalids and the aged. Beneficial properties are claimed for honey and it has been extensively used in medicine from time immemorial. Unfortunately owing to ignorance of the proper methods of extraction and preservation of honey the standard of purity of the material has been very low. Now that modern methods of bee-keeping, wherein hygienic extraction of honey is rendered possible without disturbance to the bees, have been brought to light, it is up to the public to take advantage of this knowledge.

Bee-keeping is regarded as a spare-time hobby fit to be taken only by leisured classes. This view is erroneous and requires to be promptly corrected. Anybody and everybody can take it up with advantage to himself. Bee-keeping can be turned to a remunerative enterprise if managed well and this fact needs wider publicity. The poorer classes who are in need of a subsidiary industry to augment their meagre income might adopt bee-keeping as a cottage industry.

There are many reasons why bee-keeping should receive wide-spread support and recognition all over the country. Firstly, our Presidency is very fortunate in having a varied and rich flora. Excepting some portions of the Ceded districts this Presidency offers great scope for the development of the bee-keeping

industry. There are pasturage plants like *cholam*, *cambu*, maize, castor, peltophorum, babool and coconut which yield pollen in profusion right through the year and plants like cotton, tamarind, *neem*, drumstick and plantain which produce nectar in abundance. Besides these, some of the wild flora comprising of weeds, scrub jungle and forest trees constitute a potent supply of the two bee-foods. The existence of a variety of pasturage plants goes a long way in making bee-keeping successful. Secondly the art of bee-keeping is not cumbersome or complicated as is supposed to be. Young and old of both sexes can pick up a working knowledge of it in about a month and can become successful bee-keepers in due course. Thirdly it requires very little of capital outlay unlike other industries and is therefore pre-eminently suited to the pocket of a poor man. All that would be needed in the initial stages would be a unit of six hives and a small honey extractor and these will not cost more than Rs. 30. It is possible to recoup the investment and even get a small surplus by the end of the first year of starting, if season is favourable. From the next year onwards it will turn into a paying concern. Rs. 30 worth of honey may be reasonably expected in a year from six hives which have been determined to be the manageble number which one can handle with ease. It will thus be seen that points are all in favour of bee-keeping being adopted as a cottage industry. Finally a demand for pure honey which is only obtainable from improved methods of bee-keeping is bound to increase when the public come to realise that honey obtained by primitive methods of extraction is impure and will get spoiled soon and that money spent on bad stuff is money lost.

The Agricultural Department has been carrying on propaganda for the spread of bee-keeping industry in the rural parts. There is a well-equipped central apiary at the Agricultural College, Coimbatore, where research on various aspects of bee-keeping is carried out. Cheap appliances like hives, extractors, drone traps, foundation combs, bee-escapes and queen excluder sheets have been devised and are supplied at about cost price. A short course in bee-keeping is conducted every year for giving practical training to sons of farmers. There are officers trained in bee-keeping in different taluks, who render first hand help and advice to interested parties. Bee-keeping appliances are exhibited in most of the fairs and exhibitions. To meet the demand for information from the public on the subject, a popular account, *Bee-keeping in South India*, has been prepared and translated into Tamil and Telugu. A small pamphlet on *Practical Hints on Bee-keeping* has also been published for free distribution to the *ryots*. A further spur to the spread of the bee-keeping industry is given by holding an annual "Honey Week" throughout the Presidency, when the advantages of bee-keeping are brought home to a large circle of *ryots*. As a result of the propaganda work done by the Department and also a few private organisations the industry has made rapid strides. From the small beginning of 1088 hives in 1936 there are well over 7260 hives in working conditions at present.

Now a word more about the care and management of bee colonies. After hiving, colonies have to be kept in suitable localities where pasturage plants are found in abundance. These have to be examined periodically (at least once a week) to note whether egg-laying is taking place normally and whether the bees collect and store sufficient food material. If the progress of the colony is hampered by want of a queen, a fresh queen will have to be introduced or the colony united with one having a queen. In case the colony does not store food, the bees must be fed with sugar syrup or honey which induces them to go for foraging work. It is also necessary to protect the colonies from the ravages of the bee-enemies. During honey season, supers have to be provided for the storage of surplus honey. When the cells of the super combs are sealed, honey is extracted by the extractor, filtered and ripened properly before preservation,

Detailed information on the subject can be had either from the Government Entomologist, Lawley Road P. O., Coimbatore, or the District Agricultural Officers.

Correspondence.

To

The Editor, The Madras Agricultural Journal.

Sir,

PROFITEERING

It is seen that both the Government and some private persons attempt now and then to prevent profiteering in respect of the articles of human consumption. Does their duty end there? Need not the consideration and exertion extend to cattle-food also? No cattle, no people. Can we, the so-called civilised portion of mankind exist without the bovine species? They are the producers of grain and milk, without which we cannot do and which are now needed more and more each day because, owing to the recent "Drink more milk, drink pure milk" propaganda, even those people forming the bulk of the population of the country who were content with appeasing hunger before have begun to hanker for palate-pleasing preparations of which milk is an important ingredient. The demand for that article accordingly goes on rising and many people of the hard agricultural life are taking to the easy milk vendor's profession. But the price of that article has of late come down from 8 to 4 annas per Madras measure, while that of fodder is often, owing to the clear profiteering propensity on the part of the dealers, raised favourably high. How to make both ends meet? No doubt the drawing of milk to the last drop from the udder and killing the dumb, helpless calves by inches after torturing them into keeping pace with their interestedly well-fed mothers, enables to some extent the business being carried on. Last year the *cholam* (sorghum) straw which is the stuff mainly fed to milch animals in these parts sold at Rs. 2 and even Rs. 1—8—0 per 100 *kathais* (bundles) delivered at your door. But this year, for the same quantity, as much as Rs. 10 is demanded. And yet there was no complaint at the last harvest of failure of fodder in this neighbourhood, whatever the fate of grains. Surely then, here is a case for Government inferference. They are morally bound to protect the interests of these indispensable, inarticulate subjects of theirs more than those of their rational subjects. In the U. S. A. insurance against fodder famine is said to be organised by the Government, and in Hyderabad there seems to be Government fodder depots. Our Government have done nothing of the kind so far and have thrown the poor creatures entirely on the tender mercies of their kind or cruel owners. They may be good enough without further loss of time to open fodder depots at convenient distances, appointing the unemployed agricultural graduates to be in charge of them, thus killing two birds with one shot. Purchases are to be made at harvest wholesale and cheap, and sales effected at moderate prices throughout the year. This is helping both men and beast. They must also insist on municipalities and other authorities where cattle are kept, to establish regular pastures without which the animals will never thrive, however well they may be stall-fed. They have all along been only acquiring sites and constructing buildings, etc. for human beings, at enormous costs for the indisputably less important educational institutions and play-grounds.

Lawley Road, 28—6—'42.

C. N. Subramanya Iyer.

Crop and Trade Reports.

Statistics—Crop—Groundnut—1942—Summer and early crops—Condition report. Sowings of the summer crop of groundnut are reported to be generally restricted owing to (i) want of timely sowing rains, (ii) propaganda conducted to reduce the area under groundnut cultivation in the last season and (iii) the low price of groundnut at the time of sowing. Sowings of the early crop in Coimbatore are reported to be normal on account of the favourable season and very promising market conditions.

Harvest of the summer crop of groundnut has commenced in parts. The yield per acre is expected to be normal in Cuddapah and Tanjore and below normal in the other districts. The condition of the early crop of groundnut is satisfactory.

The wholesale price of groundnut (shelled) per imperial maund of 82⅔ lb. (equivalent to 3,200 tolas) as reported from important market centres on the 6th July 1942 was Rs. 7—12—0 in Vizianagaram, Rs. 6—13—0 in Hindupur, Rs. 6—8—0 in Cuddapah and Vellore, Rs. 6—6—0 in Guntakal, Rs. 6—3—0 in Cuddalore, Rs. 6—1—0 in Guntur and Adoni, Rs 6—0—0 in Bellary and Rs. 5—9—0 in Salem. When compared with the prices published in the last report, i. e., those which prevailed on the 14th April 1942, these prices reveal a rise of approximately 63 per cent in Vizianagaram, 51 per cent in Hindupur, 46 per cent in Cuddapah, 41 per cent in Vellore, 34 per cent in Cuddalore, 28 per cent in Bellary, 27 per cent in Adoni, 24 per cent in Guntur and 13 per cent in Salem.

(Director of Industries & Commerce, Madras,)

Cotton Raw, in the Madras Presidency. The receipts of loose cotton at presses and spinning mills in the Madras Presidency from 1st February 1942 to 10th July 1942 amounted to 351,775 bales of 400 lb. lint as against an estimate of 563,800 bales of the total crop of 1941-42. The receipts in the corresponding period of the previous year were 414,315 bales. 352,665 bales mainly of pressed cotton were received at spinning mills and 2231 bales were exported by sea while 70,843 bales were imported by sea mainly from Karachi and Bombay.

(Director of Agriculture, Madras.)

Mofussil News and Notes.

Central Delta—East Godavari District. To give a drive to 'Grow more food' campaign the District Collector, M. S. Sivaraman, Esq., I. C. S., District Agricultural Officer, Cocanada, Sri S. Sitarama Patrudu, L. Ag., the Executive Engineer, Central Division, Sri M. K. Narambunathan Pillai, and Md. Abdul Satar Sahib, Revenue Divisional Officer, Amalapur, toured in the central delta from the 10th to the 12th of this month to consider the question of bringing waste lands under cultivation. Two meetings were held in the course of their tours with large gatherings of *ryots* one at Razole and the other at Amalapur in which the District Collector considered the question of assignment of waste lands to cultivators for growing more food crops and exhorted the *ryots* to increase the yields in the delta with green manuring and the other improvements advocated by the Agricultural Department. The advantage of planting trees like Pongamia, Terminalia, Albezzia, Bamboo, etc., were explained, and to harness the enthusiasm created for tree planting for making use of every bit of land available in the tract the District Collector arranged for immediate supply and distribution of seeds and seedlings of the above free of cost. The District Agricultural Officer delivered interesting lectures on how the *ryots* are to come to the rescue of the

country under the present war conditions in increasing the food production by taking to the various agricultural improvements. The Executive Engineer explained the present situation with regard to the irrigation schemes recently completed and those that are contemplated and promised every help to the *ryots* with the resources the Public Works Department can command. Agricultural exhibitions were also conducted in connection with these meetings. A large number of vegetable packets of assorted varieties was distributed at the gatherings. (S. S. Rao)

Agricultural Exhibition at Hosur. An Agricultural Exhibition was held at Hosur from 22—6—42 to 25—6—42 in connection with the annual tournaments of the Hosur Rural Uplift Associations. Besides improved implements, the Departmental strains of paddy, *ragi*, *cholam*, *cumbu* and redgram were exhibited in the stall allotted for the Agricultural Department A special feature of the exhibition was that varieties of mangoes—*Peether*, *Rumani*, *Neelam*, *Bangalore* and *Malgova*—raised by *ryots* were put up in the show. Indigenous varieties of local vegetables—*vendai*, brinjals, snake gourd and pumpkin—were also exhibited and these were much appreciated by the visitors. The entomological and mycological show-cases were put up, and pests and diseases that damage the crops in the locality were explained to the *ryots*. Specimen crops of *daincha*, sunnhemp, E. C. 593 (*ragi*) and Co. 13 (short duration paddy strain) were included in the list of exhibits and these were very attractive. A lecture was delivered by the Agricultural Demonstrator with the aid of loud speaker on the ways and means that are to be adopted by *ryots* for increasing the area under food crops and vegetables. (S. D).

College and Estate News.

Students' Corner. As in the last year, the first year class has now its full strength, the number of students admitted being forty-eight. As many as sixteen students have joined the Short Course for Farm Management.

Students' Club. The first general body meeting of the Students' Club was held on the 26th June 1942 with Sri. H. Shiva Rao, the Vice-President, in the chair. The following Office-bearers were elected for the year 1942-43 :—

Club Secretary	—	Sri. C. Srinivasan.
Game „	—	„ I. L. Narasimha Rao.
Tennis Captain	—	„ P. L. N. Somayajula.
Hockey „	—	„ C. Vasudeva Reddi.
Cricket „	—	„ R. Narasimham.
Foot ball „	—	„ G. H, Shanker Reddi.
Class Representative, iii year	—	„ K. V. S. Suryanarayanamurthi.
„ „ ii „	—	„ K. Appalanarasiah.

At the same meeting condolence resolutions were passed at the demise of Dr. N. R. Rajaratnam, G. M. V. C., P. G. (Edin.), who was lecturer in animal hygiene, and Sri. Y. V. S. S S. Narasimhamurthi of B. Sc. Ag. class ii, and the resolutions were communicated to the respective bereaved families.

M. Sc. Course. Of the students who passed out of the college this year Sri. C. Sankara Rao has joined the section of the Government Agricultural Chemist and Sri. T. V. Suryaprakasa Rao and Sri. C. L. Sundararajan, that of the Fruit Specialist, Koduru, for post graduate work.

Visitors. Sri. K. C. Naik, M. Sc. Fruit Specialist, Koduru camped at the College for ten days from the 13th July '42.

Departmental Notifications.

Gazetted Service.

Appointments.

Sri. M. Anandan, District Agricultural Officer, Tanjore appointed to act as Dy. Director of Agriculture and posted to Central Division, Chittoor vice Sri. T. Budh avidheya Rao granted leave.

Sri. S. N. Chandrasekhara Ayyar, Assistant in Botany I Grade, is appointed to officiate as Lecturer in Botany, Agricultural College, Coimbatore vice Sri. P. S. Jivanna Rao due to retire.

Sri. S. Sitarama Patrudu, District Agricultural Officer, Cocanada, promoted to act as Dy. Director of Agriculture, Northern Division, Guntur.

Sri. K. K. Raghavan, Farm Manager, Agricultural Research Station, Koilpatti, is appointed to officiate as District Agricultural Officer, Tanjore.

Postings & Transfers.

Sri. K. Jagannatha Rao, D. A. O, Vizagapatam, to D. A O., Guntur.

Sri. R. Swami Rao, D. A. O., Guntur, to D. A. O., Cocanada.

Sri. M. V. Raghava Rao, on the expiry of his leave to be D. A. O., Vizagapatam.

Leave.

Sri. K. Venkatarama Ayyar, D. A. O., Ellore, l. a, p. for 34 days from 22–6–42.

Subordinate Service.

Transfers.

Name of officers.	From	To
Sri D. S. Subramania Ayyar,	A. D., Devakottai,	A. D., Srivilliputhur.
„ S. Muthuswami,	A. D. Srivilliputhur,	F. R. S., Kodur.
„ M. P. Gowrisankara Ayyar,	A. D (on leave),	A.-D., Devakottai.
„ K. Purushotham,	F. M., Kalahasthi,	A. D., Guntakkal.
„ C. Bhujanga Rao,	Fruit Asst., Anakapalle,	F. R. S., Kodur.
Janab Syed Ibrahim,	F. M, A. R. S., Siruguppa,	Fruit Asst., Anakapalle.
Sri R Shanmugasundaram	F. R. S, Kodur,	Kallar & Burliar Stations, Mettupalayam.
„ M. K. Padmanabhan,	Asst. in Paddy, Coimbatore,	A. R S., Aduturai.
„ P. Uttaman,	Asst. in Paddy (on leave),	Asst. in Paddy, Coimbatore.
„ K. Dorai Raj,	F. M., A. R. S., Siruguppa,	Rice Res. Sta., Chinglepet.
„ N. C. Thirumalachari.	A. D., Srivilliputhur,	A. D., Lalgudi.
Janab P. P. Syed Muhammad,	A. D., Lalgudi.	A. D., Trichengode.
Sri P. S. Krishnamurthi.	Asst. in Entomology, Nellore,	Asst. in Entomology, Coimbatore.
„ K. Hanumantha Rao	F. M., Siruguppa,	A. D., Adoni.
„ K. Balaji Rao,	A. D., Adoni.	A. R. S., Siruguppa.
Janab Muhammad Obedulla Shah Sahib.	A. D., Periakulam,	F. M., A. R. S.. Koilpatti.
Sri G. Venkatakrishnan,	F. M., Kallar Gardens, Mettupalayam,	A. D., Periyakulam.

Janab Muhammed Basheer,	A. R. S., Tindivanam,	Asst. in Entomology, Coimbatore.
Sri K. Ambikacharan,	A. D. (on leave).	A. D., Kanigiri.
,, V. S. Ranga Acharlu,	F. M A. R S., Guntur,	F. M., Kalahasti.
,, P. Sudarsanam Naidu,	F. M. A. R. S, Guntur (on leave),	F. M. A. R. S., Guntur.

Leave.

Name of officers.	Period of leave.
Sri P. C. Sahadevan, A. R. S., Pattambi,	Earned leave for 30 days from 2-7-42.
,, E. R. Gopala Menon, Entomology Asst.,	Extension of l. a. p. for 1 month from 1—7—42.
,, N. Srinivasa Rao, A. D Kollegal,	Extension of l. a. p. for 6 weeks from 1—7—42.
,, P. Uttaman, Asst. in Paddy, Coimbatore,	Extension of l. a. p. for 2 months from 1—6—42
,, K. Raman Menon, F. M. A. R. S., Nileshwar,	L. a p. for 1 month and 10 days from 20—7—42.
,, G. Ganapathi Ayyar, Asst in Chemistry, Coimbatore.	L. a. p for 1 month from 2—7—42.
,, C. T. Ittyachan, Asst. in Oil Seeds, Coimbatore,	Earned leave for 59 days from 3-7-42.
,, D. Panakala Rao, A. D. Tadepalligudam,	Extension of l. a. p. for 2 months from 11—6—42

ANNOUNCEMENT

Madras Agricultural Students' Union.

As the College Day and Conference could not be held in July 1942 as usual, it was decided to hold a General Body Meeting in August 1942 to elect office bearers and to sanction budget estimates for 1942—43.

A list of resident members, nomination papers, audit report for 1941—42 and the budget estimate for 1942—43 are enclosed in the Journal for the members.

Lawley Road, P. O.,
July 20, 1942.

V. GOMATHINAYAGAM,
Secretary.